

DECLARATION

I, Xie Shao, declare and state as follows:

1. I am one of the inventors named on the above-referenced patent application. I am currently a Division Manager in the Research and Development Division with Brewer Science Inc., and have been employed by Brewer Science Inc. for 10 years. I previously served as a Product Manager in the Chemical Division at Brewer Science Inc., and as Group Manager for the Anti-Reflective Coating Section of the Research and Development Group at Brewer Science Inc.

2. Under my direction and control, U.S. Patent No. 5,602,198 to Das et al. and U.S. Patent No. 6,010,956 to Takiguchi et al. were tested to show that the compositions disclosed by these references do not inherently possess the properties recited by the claims of this application.

U.S. PATENT NO. 5,602,198 TO DAS ET AL.

3. An acrylic resin solution was prepared exactly as described in Example 1 (beginning in column 5, line 55) except that the quantities of the various ingredients were scaled down. However, the same relative weight percentages were used. The exact amounts of the various compounds that were utilized are set forth in Table A.

Table A

	INGREDIENTS	WEIGHT (g)
Initial Charge	Xylene	19.98
Feed A	Cyclohexyl methacrylate	57.70
	2-hydroxybutyl acrylate	8.90
Feed B	2,2'-azobis(2-methylbutanenitrile) (AIBN)	3.33
	Xylene	19.98

After the polymer solution was prepared, it was used to prepare a film-forming composition exactly following the procedure described in Example I beginning in column 6, line 55 of the Das et al. patent, with the exceptions described herein. The procedure actually carried out was a scaled-down version, but the same parts by weight shown in the table at the bottom of column 6 in Das et al. were maintained. One of ordinary skill in the art would expect that scaling down the composition would not alter its performance, and that scaled-down, film-forming compositions would perform similarly to those made on a larger scale according to Example I of Das et al. The only other change to the procedure described in Example I was that ethanol was used in place of n-butanol. This should not alter the performance of the film-forming composition, as ethanol is one of the allowable monohydric alcohols set forth starting in column 3, line 39 of Das et al. The amount of each ingredient used is set forth in Table B.

Table B

INGREDIENTS	WEIGHT (g)
Polymer solution prepared above	13.335
CYMEL®303	1.435
Xylene	0.73
n-Butyl acetate	0.73
Ethanol	0.365
TINUVIN 328	0.765
TINUVIN 292	0.095
K-CURE 1040 ¹	0.12

¹K-Cure 1040 was used in place of Cycat-4040, which was used by Das et al. Both are 40% by weight solutions of p-toluenesulfonic acid.

The resulting formulation was coated onto silicon wafers according to the Prebake Thermal Stability Test and Film Shrinkage Test procedures outlined in the present patent application under the Detailed Description of the Preferred Embodiments section. The results of the Prebake Thermal Stability Test are set forth in Table C.

Table C

Prebake Thermal Stability Test					
Sample	30 s Prebake Temp	Thickness, Å	Post Bake Temp	Final Thickness, Å	% Removed
Das et al.	150°C	8889±590	100°C	8609±693	3.15

The Das et al. composition does not possess the property of being at least about 70% removed from the substrate following a Prebake Thermal Stability Test.

The results of the Film Shrinkage Test are set forth in Table D.

Table D

Film Shrinkage Test					
Sample	30 s Prebake Temp	Thickness, Å	Post Bake Temp	Final Thickness, Å	% Removed
Das et al.	150°C	8886±734	190°C	8364±570	5.87

The Das et al. composition does display the property of having less than about 15% film shrinkage when subjected to the Film Shrinkage Test.

U.S. PATENT NO. 6,010,956 TO TAKIGUCHI ET AL.

4. The following composition was prepared according to the methods described by Takiguchi et al. in Example 1, starting at column 13, line 65. The amounts of all ingredients were scaled-down from the described procedure, maintaining the same relative parts by weight. One of ordinary skill in the art would expect that a composition including the same ingredients on a smaller scale would perform in the same way as a composition prepared on a larger scale. EPON 829 or EPON 825 (Resolution Performance Products), a bisphenol A type epoxy resin, was used as a binder resin in place of N-673, an o-cresol novolak epoxy resin. While EPON 829 is not specifically listed in the example, it is a bisphenol A type epoxy resin, which is listed in the list of examples of binder resin at column 4, line 10, and is similar to Epikote 828 used in Example 2. The amounts of ingredients used are shown below in Table E.

Table E

INGREDIENT	WEIGHT (g)
EPON 829	25
Dicyandiamide	1.75
2-methyl imidazole amine	1.5
SWAZOL 1500	2.5
Diglycol Acetate	7.5
KS-66	0.5
LIONOL GREEN	0.625
MICROACE	2.5
AEROSIL	0.5
Barium Sulfate	15

The mixture was not mixed using a triple-roll mill as stated in the Takiguchi et al. example. The resulting material was spin-coated onto silicon wafers, but large particles remained in the composition. Sample 27-2 was ground with a mortar and pestle to remove large particles. The solid ingredients of Sample 28-1 were ground into a powder before the liquid components were added. Neither of these methods was successful in decreasing particle size significantly, so the material was used as is. In Sample 28-2A, EPON 829 was replaced with EPON 825.

The resulting formulation was coated onto silicon wafers according to the Prebake Thermal Stability and Film Shrinkage Test procedures described above. Film thickness measurements were made using the highest and lowest points on the Alpha Step. The results of the Prebake Thermal Stability Test are set forth below in Table F.

Table F

Prebake Thermal Stability Test					
Sample	30 s Prebake Temp	Thickness, μm	Post Bake Temp	Final Thickness, μm	% Removed
27-2	219°C	35 to 45	100°C	20 to 43	18.18
28-1	219°C	8.95	100°C	21	-134.00

As shown above, neither of the samples prepared according to Takiguchi et al. displayed the property of being at least about 70% removed from the substrate after the Prebake Thermal Stability Test.

The results of the Film Shrinkage Test are shown below in Table G.

Table G

Film Shrinkage Test					
Sample	30s Prebake Temp	Thickness, μm	Post Bake Temp	Final Thickness, μm	% Shrinkage
28-2A	190°C	10 to 21	240°C	28 to 45	-135.48
27-2	226°C	9.231 \pm 0.952	226°C	9.309 \pm 0.747	-0.84
27-2	219°C	9.227 \pm 0.730	230°C	9.343 \pm 0.577	-1.26

As seen from the results in the table, the sample exhibited very little sample shrinkage, but actually increased in size.

5. An additional composition according to Example 1 of the Takiguchi et al. patent was prepared in the same manner described above, except ECN 1299 was used as the polymer. As before, the amounts of the ingredients were scaled down, with the original percentage by weight of each ingredient being maintained. One of ordinary skill in the art would expect that a composition made on a smaller scale would perform similarly to the same composition made on a large scale.

ECN 1299 (poly[(o-cresyl glycidyl ether)-co-formaldehyde]) is an o-cresol novolak resin similar to the N-673 used in Example 1. The Takiguchi et al. patent lists o-cresol novolak resins as an example of suitable binder resins (column 4, line 2). The amounts of ingredients used in the composition are set forth in Table H.

Table H

INGREDIENT	WEIGHT (g)
ECN 1299	25
Dicyandiamide	1.75
2-methyl imidazole amine	1.5
SWAZOL 1500	2.5
Diglycol Acetate	7.5
KS-66	0.5
LIONOL GREEN	0.625
MICROACE	2.5
AEROSIL	0.5
Barium Sulfate	15

With this formulation, spin-coating of the sample onto silicon wafers would not yield a uniform film. As a result, some of the samples were diluted at a 2:1 ratio with the solvent used in this composition, and spin-coated onto silicon wafers according to the Prebake Thermal Stability Test procedure. The undiluted samples were also spin-coated onto a silicon wafer at 2,500 rpm in an attempt to achieve a more uniform layer. The film thickness of each layer was measured using the highest and lowest points on an Alpha Step. The results of the Prebake Thermal Stability Test are shown below in Table I.

Table I

Prebake Thermal Stability Test					
Sample	30s Prebake Temp	Thickness, μm	Post Bake Temp	Final Thickness, μm	% Shrinkage
35-2 ¹	219°C	0.59 to 4.02	100°C	0.65 to 4.82	-18.66
35-2 ¹	168°C	1.02 to 14.9	100°C	0.17 to 7.9	49.31
35-2 ¹	190°C	0.025 to 2.7	100°C	0.305 to 2.8	-13.94

¹ sample diluted at a 2:1 ratio

As shown above, despite changing the prebake and postbake temperatures, the composition according to Takiguchi et al. does not possess the property of being at least about 85% removed after the Prebake Thermal Stability Test.

The results of the Film Shrinkage Test are shown below in Table J.

Table J

Film Shrinkage Test					
Sample	30s Prebake Temp	Thickness, μm	Post Bake Temp	Final Thickness, μm	% Shrinkage
35-2 ¹	219°C	16.005	219°C	16.133	-0.80
35-2 ²	219°C	39.9782	219°C	39.9917	-0.03
35-2 ²	219°C	41 to 82	219°C	41 to 82	0.00
35-2 ¹	168°C	24.5	168°C	39.2	-7.35
35-2 ¹	190°C	0.52 to 9.8	190°C	9.8	0.00

¹ sample diluted 2:1

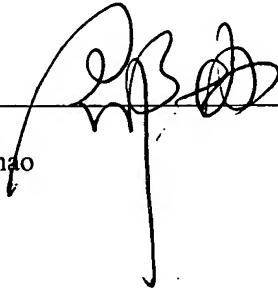
² undiluted sample, spun at 2,500 rpm

As shown in the table above, the composition according to the Takiguchi et al. patent does

possess the property of having less than about 15% shrinkage when subjected to the Film Shrinkage Test.

I further declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful, false statements and the like are punishable by fine or imprisonment, or both under § 1001 of Title 18 of the United States Code, and such willful, false statements may jeopardize the validity of any patents issued from the patent application.

Date: July 5, 2004



Xie Shao